with the geographical distribution and one or more local Japanese names. Nearly one third of the species—396, to be exact—are illustrated, the admirable figures which have appeared in the publications of Jordan and his associates being reproduced. An excellent index to genera, species and Japanese names, covering 64 pages, greatly enhances the usefulness of the work. (This index, by the way, contains a number of misspellings—for instance, of *Scapanorhynchus, Etmopterus,* etc.).

A critic might perhaps find fault with the retention of a few superseded names, such as *Mitsukurina* for *Scapanorhynchus,* when it has been fairly well established that the former is identical with the fossil sharks which have long been known under the latter name; or with the omission of certain desirable references, to show that *Zameus*—to mention but a few instances—is a synonym for *Scymnodon, Deania* a synonym for *Centrophorus, Etmopterus frontimaculatus* probably a synonym for the Mediterranean *Spinax pusillus,*[1] etc. But in answer to such criticisms it may be said that the present list was obviously intended as a mere stock-taking of all the species that have been proposed, to serve as a basis for future work on the fishes of Japan; that it was not the purpose of the authors to give complete synonymies; and that these matters will be dealt with in the revisions of the various groups now being published by Jordan and his associates in America, or in the monograph by Tanak, which is appearing in part in Japan. Altogether the catalogue is carefully compiled, and will be invaluable to all students of the fishes of Japan.

The work was seen through the press by Dr. Shigeho Tanaka, lecturer in zoology in the Imperial University of Japan, and a co-author of the present work; and to him are due the thanks of all who will profit by this volume, for the great care he has exercised in guarding against typographical errors in the text.

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[1] See C. Tate Regan, "A Synopsis of the Sharks of the Family Squalidæ," *Ann. Mag. Nat. Hist.,* 8 ser., II., 1908, pp. 39–57.

Pflanzenmikrochemie. Ein Hilfsbuch beim mikrochemischen Studium pflanzlicher Objekte von Dr. O. TUNMANN, Privatdozent an der Universitaet Bern. Ein Bd., pp. 631, mit 137 Abbildungen im Text. Verlag von Gebrueder Borntraeger, Berlin. 1913. M. 18.50.

That of the writing of books there is no end is one of the few biblical quotations which even the average freshman in college will recognize. Moreover, the graduate student in science, when sent to the library for references, is apt to wish that there might be fewer books for him to consult. Yet it is with a peculiar delight that the phytochemist witnesses the renewed literary activity in his particular field of research. Synthetic chemistry had so completely overshadowed phytochemistry for a generation and more since the days of Kekulé's structural theories, that the phytochemist is once more beginning to feel that his particular aspect of chemical research is again coming to its own. With a general treatise such as that by Haas and Hill, with staetter and Stoll on chlorophyll, and with the volume on a special method of phytochemical technique like the one before us, all within less than a twelve-month, this unusual productivity must certainly be regarded as the heyday of phytochemical literature.

The general part of Tunmann's tome is devoted to the technique of microchemical research as applied to plants and covers sixty-three pages. Of the special part sixty-six pages are devoted to inorganic chemistry. Hence the bulk of the volume is devoted to the organic microchemistry of plants.

Inasmuch as this is the first general survey of its kind since the "Botanische Mikrotechnik" by Zimmermann made its appearance in 1892, one may gladly welcome an up-to-date treatise on this subject. Even the person who is not well acquainted with the work that has been done during the past few decades in this particular field, will be struck by the innumerable references to special "Arbeiten" with which the pages abound. The pharmacist in particular will be gratified

to see to what extent the pharmacognosist and pharmaceutical chemists have contributed to make the microchemistry of plants an important branch of phytochemical investigation, pure as well as applied.

It ought to be possible in the future to supplement the macrochemical investigation of plants in a manner that should prove productive of the very best results. If the microscope, supplemented by accessories and chemical reagents, is going to enable the phytochemist of the future to extend the macroscopic examination carried out on one or several species to all members of a genus or even family with a minimum of material and possibly of time, the boundaries of plant chemistry ought to be extended farther in a decade than they have been during a century.

E. K.

THE ORIGIN OF CLIMATIC CHANGES[1]

THE discussion of meteorological observations shows clearly that climates undergo variations of short duration, but such records as the presence of old lake beaches and the existence of well-marked glacial moraines, and other geological evidence distinctly point to climate changes covering long intervals of time. The evidence is not sufficient to characterize the variations as periodic, but the ice ages are sufficient to point to times when the conditions reached were extreme.

What may reasonably be assumed to be the chief established facts about such extensive changes may be summed up briefly as follows: Climatic changes were several, and probably many. Similar simultaneous changes occurred over the whole earth, or, in other words, it was warmer or colder over the whole earth simultaneously. These times of warmth or coldness were unequal in intensity and duration, and of irregular occurrence, and, lastly, they have taken place from very early, if not from the earliest geological age down to the present. Numerous theories, both probable and improbable, have been suggested from time to time to account for the origin of such world-wide changes, and while each has its advocates, perhaps only three may be said to claim attention to-day. These may be briefly stated as the eccentricity theory (Croll), depending on the eccentricity of the earth's orbit; the carbon dioxide theory (Tyndall), based on the selective absorption and variation in amount of carbon dioxide; and thirdly, the solar variation theory, on the assumption of solar changes of long duration. A new theory, which may be called "the volcanic dust and solar variation theory," has recently been put forward by Professor W. J. Humphreys,[2] under the guarded heading, "Volcanic Dust and Other Factors in the Production of Climatic Changes, and Their Possible Relation to Ice Ages."

The author carefully points out that the idea that volcanic dust may be an important factor in the production of climatic changes is not new, but "though just how it can be so apparently has not been explained, nor has the idea been specifically supported by direct observation." He remarks also that while the pioneers regarded the presence of volcanic dust in the atmosphere as an absorbent of radiation, and so lowered the earth's temperature, modern observation suggests the opposite effect, namely, the warming of the earth's surface.

In putting forward his views of the action of dust, Professor Humphreys proceeds first to indicate that the dust that is effective is that which is situated in the atmosphere in the isothermal region or stratosphere. He then enters into the question of the size of the particles and probable time of fall, and concludes that particles of the size of 1.85 microns in diameter would take from one to three years to get back to the earth if they originally had been thrown up by a volcanic eruption.

Considering next the action of the finest and therefore most persistent dust on solar radiation, he finds that the "interception of outgoing radiation is wholly negligible in com-

[1] From *Nature*.

[2] *Journal of the Franklin Institute*, August, 1913, Vol. CLXXVI., No. 2, p. 131; also *Bulletin of the Mount Weather Observatory*, August, 1913, Vol. VI., Part 1, p. 1.